

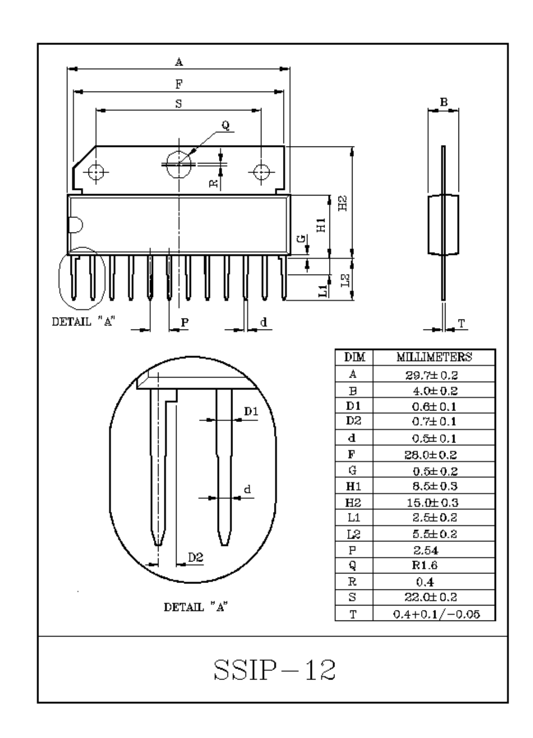
SEMICONDUCTOR
TECHNICAL DATA

KIA8207K

BIPOLAR LINEAR INTEGRATED CIRCUIT

LOW FREQUENCY POWER AMPLIFIER

KIA8207K is an audio power IC with built-in two channels developed for portable radio cassette tape recorder with power ON/OFF switch.
Because of he parts reduction and SIP (Single Inline Package), space merit is remarkable.
Thermal shut down protection circuit is built in.



DIM	MILLIMETERS
A	29.7±0.2
B	4.0±0.2
D1	0.6±0.1
D2	0.7±0.1
d	0.5±0.1
F	28.0±0.2
G	0.5±0.2
H1	8.5±0.3
H2	15.0±0.3
L1	2.5±0.2
L2	5.5±0.2
P	2.54
Q	R1.6
R	0.4
S	22.0±0.2
T	0.4+0.1/−0.05

SSIP−12

FEATURES

- High Power
  : P_{OUT}=2.5W/CH (Typ.)
  (V_{CC}=9V, R_L=4Ω, f=1kHz, THD=10%)
  : P_{OUT}=4.6W/CH (Typ.)
  (V_{CC}=12V, R_L=4Ω, f=1kHz, THD=10%)
- Low Popping Noise at Power ON.
- Small Quiescent Current
  : I_{CCQ}=21mA(Typ.) (V_{CC}=9V, V_{IN}=0)
- Soft Clip
- Built-in Thermal Shut Down Protection Circuit.
- Best for Supply Voltage 9V, 12V
- Operation Supply Voltage Range
  : V_{CC}=6~15V

MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	20	V
Output Current (peak/ch)	$I_{O(Peak)}$	2.5	A
Power Dissipation	P_D	12.5	W
Operating Temperature	T_{opr}	-20~75	℃
Storage Temperature	T_{stg}	-55~150	℃

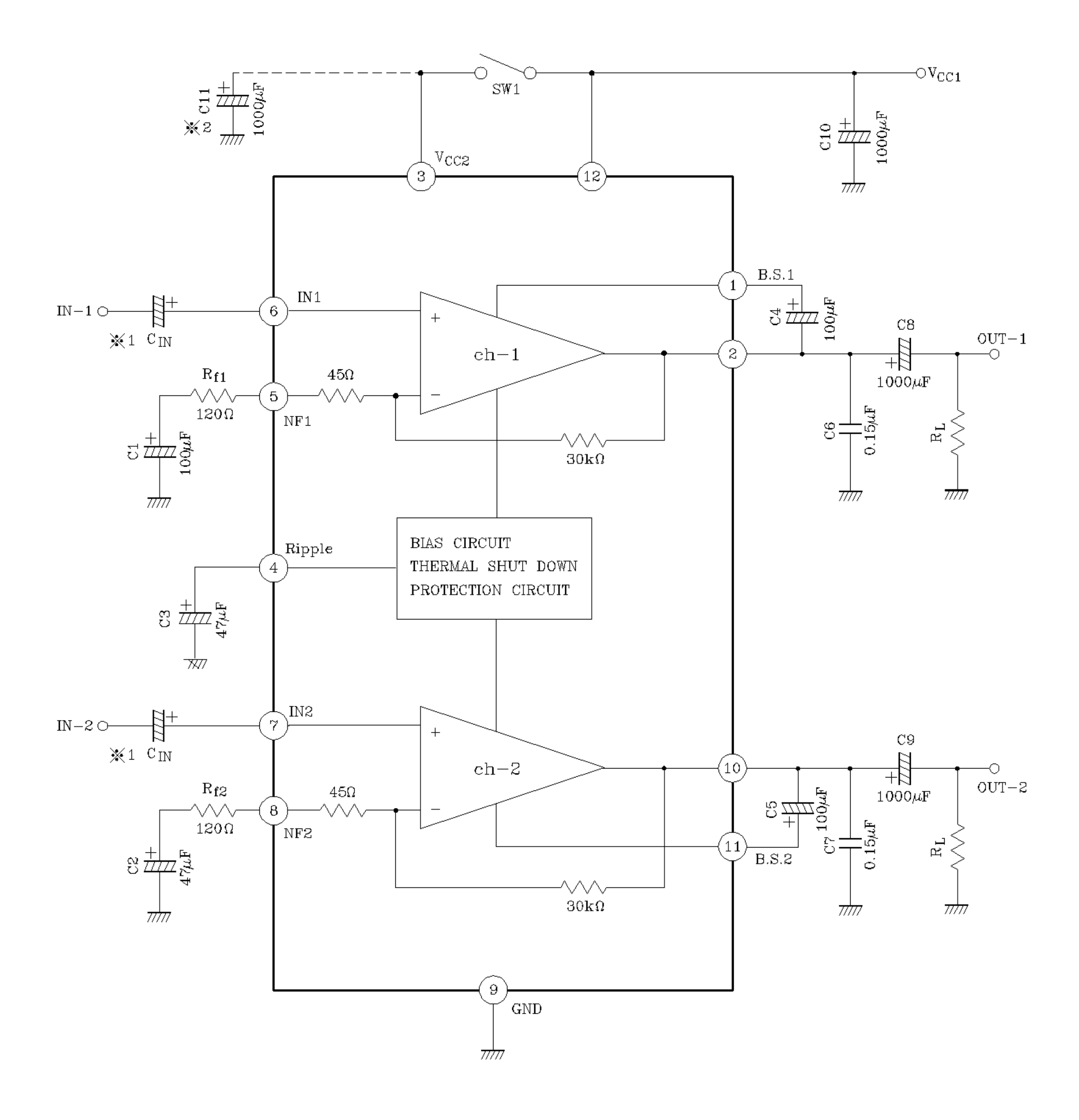
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC}=9V, R_L=4Ω, Rg=600Ω, f=1kHz, Ta=25℃)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	-	V_{IN}=0	-	21	45	mA
Output Power	$P_{OUT(1)}$	-	THD=10%	2.0	2.5	-	W
	$P_{OUT(2)}$	-	THD=10%, V_{CC}=12V	-	4.6	-	
Total Harmonic Distortion	THD	-	P_{OUT}=0.4W/ch	-	0.2	1.0	%
Voltage Gain	G_V (1)	-	R_f=120Ω, V_{OUT}=0.775Vrms	43	45	47	dB
	G_V (2)	-	R_f=0Ω, V_{OUT}=0.775Vrms	-	56.5	-	
Input Resistance	R_{IN}	-	-	-	30	-	kΩ
Output Noise Voltage	V_{NO}	-	Rg=10kΩ, BW=20Hz～20kHz	-	0.3	1.0	mV_{rms}
Ripple Rejection Ratio	R.R	-	Rg=600Ω, f_{ripple}=100Hz	-	52	-	dB
Cross Talk	C.T	-	Rg=600Ω, Amp1↔2 V_{OUT}=0dBm, f=1kHz	-	50	-	dB
Input Offset Voltage	V_6, V_7	-	-	-	30	60	mV
Stand-by Current	I_{OFF}	-	SW1→OFF	-	1	-	μA

TYPICAL DC VOLTAGE OF EACH TERMINAL (V_{CC}=9V, Ta=25℃)

TERMINAL No.	1	2	3	4	5	6	7	8	9	10	11	12
DC VOLTAGE (V)	8.7	4.5	VCC	5.0	0.7	0.03	0.03	0.7	GND	4.5	8.7	VCC

BLOCK DIAGRAM / TEST CIRCUIT



* 1 This IC can be used without coupling capacitor (C_{IN}). If volume slide noise occurred by input offset voltage is undesirable, it needs to use the capacitor (C_{IN}).

* 2 The condenser between the pin ③ and the GND (C11) is for reducing pop noise when the power ON/OFF switch (SW1) is set to ON/OFF.

APPLICATION INFORMATION AND APPLICATION METHOD

1. ADJUSTMENT OF VOLTAGE GAIN

The voltage gain G_V is obtained as follows by R_1, R_2 and R_f in Fig 1.

$$G_V = 20 \log \frac{R_f + R_1 + R_2}{R_f + R_1}$$

When R_f=0, G_V=56.5dB (Typ.)
When R_f=82Ω, G_V=45dB (Typ.)

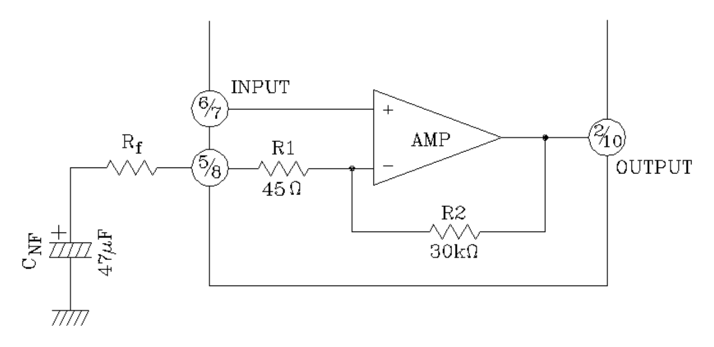


Fig. 1

By increasing R_f, reduction of G_V is possible. However, since the feedback increase is liable to produce oscillation, it is recommended to use this at 40dB or over.

2. THERMAL SHUT-DOWN CIRCUIT

The thermal shut-down circuit is built in for the purpose of preventing the destruction of IC due to the abnormal temperature rise when the heat radiation is insufficient. The operation temperature is set at radiation Fin temperature 175℃ (Typ.). At this temperature or over the bias is interrupted to prevent the destruction of IC.

3. INPUT STAGE

The input circuit of this IC is as shown in Fig. 2. PNP Tr:Q1 is provided in the input circuit so as to make its usage possible without the input coupling capacitor.
However, at pins ⑥ and ⑦, max 60mV offset voltage is produced. Application after checking volume slide noise is recommended. For cutting the volume slide noise, insert the input capacitor : C_{IN} in series to interrupt the DC component.

Fig. 2

4. OSCILLATION PREVENTIVE MEASURES

For oscillation preventive capacitor C_6 and C_7 between the output terminal and GND, it is recommended to use polyester film capacitor having good characteristics for temperature and for high frequency.
Since the characteristics of the capacitor is liable to be influenced by the temperature, use this capacitor after the temperature test to check the oscillation allowance.
In addition, as the position of the electrolytic capacitor has a remarkable influence on the oscillation, connect C_{10} to V_{CC} at the nearest possible position from power GND.
At using this application with the voltage gain reduced, oscillation is liable to be produced.
Apply the capacitor after checking enough for its capacity, type and mounting position.
* As the oscillation allowance varies according to the printed pattern layout, the standard printed board of KEC is recommended to be referred to design it.

5. POWER ON/OFF SWITCH

There is power ON/OFF switch at pin ③. However, output power is changed by ③ pin supply voltage when pin ③ supply voltage is not same pin ⑫ supply voltage, after referring to attached date, select pin ③ supply voltage.

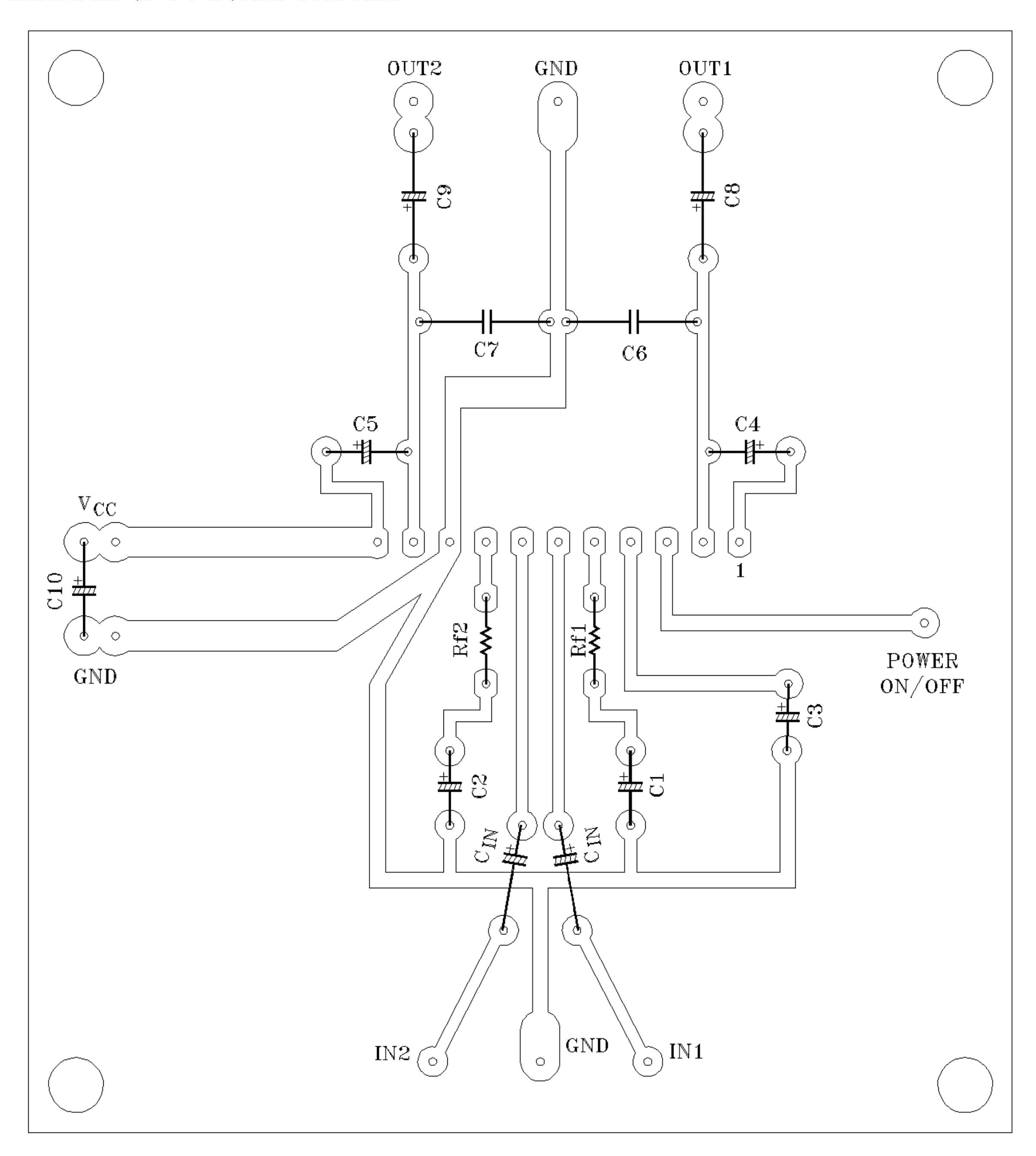
6. INPUT VOLTAGE

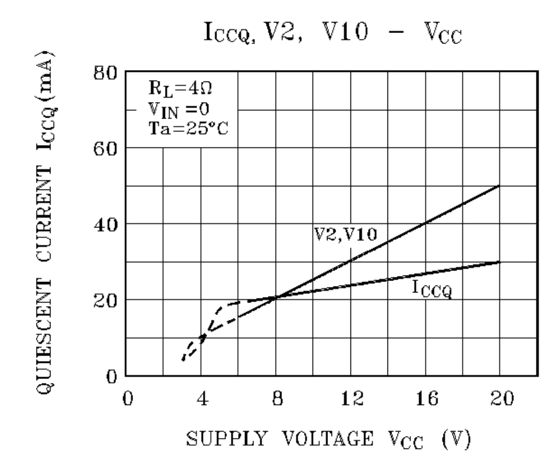
When the excessive signal is input, turning-up is produced in the clip waveform. The turning-up point is V_{IN}=30mV_{rms}(Typ.) : V_{CC}=9V, R_L=4Ω, f=1kHz : Enough care must be taken for this phenomenon.

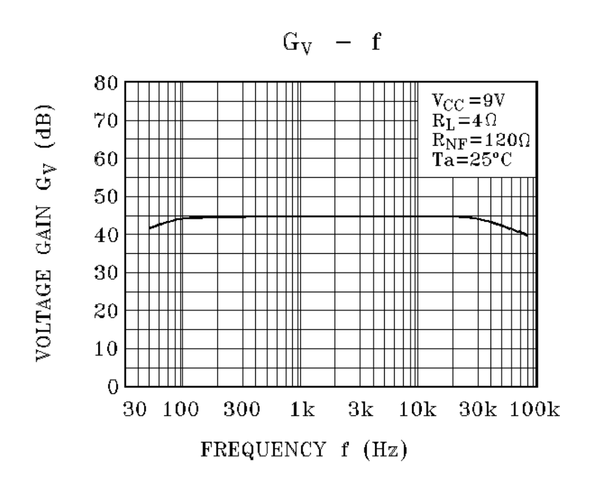
7. GND LINE

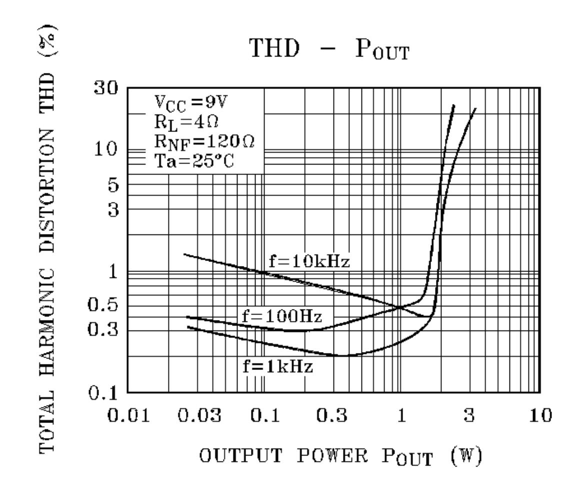
GND pin is not separated for Pre-GND and for PW-GND. That is liable to cause distortion and cross talk worse. Before use this IC, please check it.

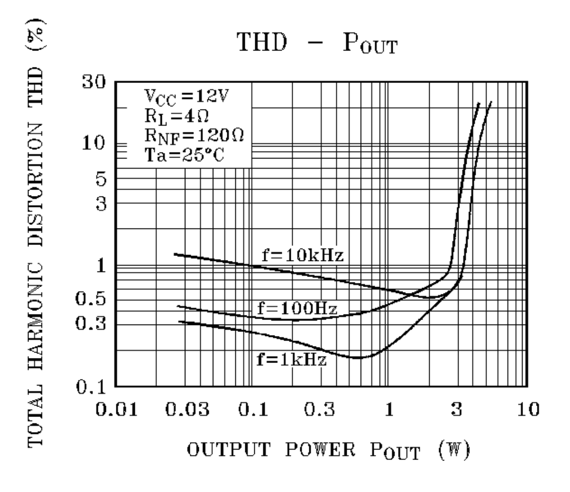
EXAMPLE OF PC BOARD PATTERN

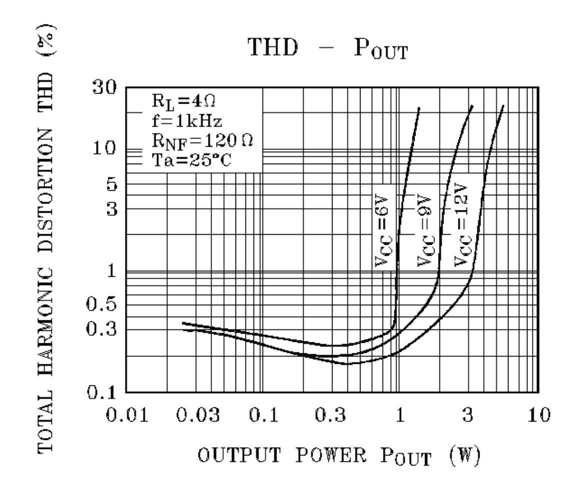


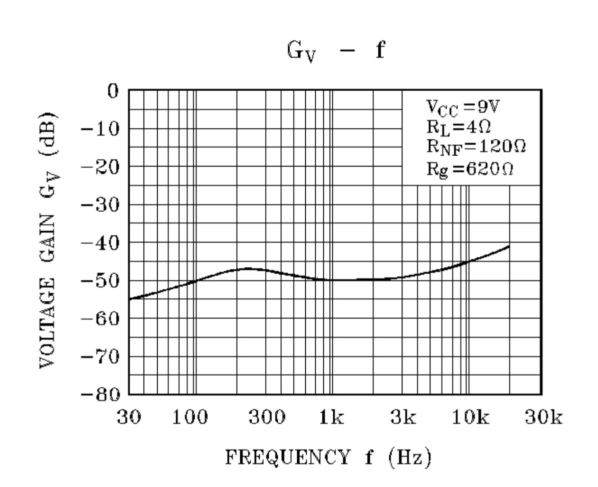

I_{CCQ}, V2, V10 – V_{CC}
R_L=4Ω
V_{IN}=0
Ta=25°C
V2,V10
I_{CCQ}
QUIESCENT CURRENT I_{CCQ} (mA)
SUPPLY VOLTAGE V_{CC} (V)

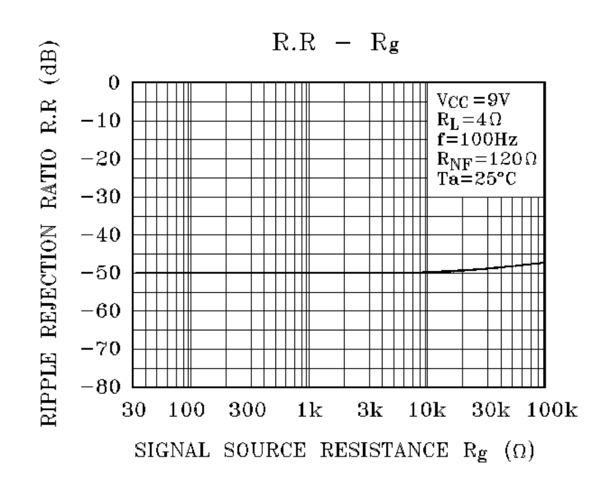

G_V – f
V_{CC}=9V
R_L=4Ω
R_{NF}=120Ω
Ta=25°C
VOLTAGE GAIN G_V (dB)
FREQUENCY f (Hz)


THD – P_{OUT}
V_{CC}=9V
R_L=4Ω
R_{NF}=120Ω
Ta=25°C
f=10kHz
f=100Hz
f=1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

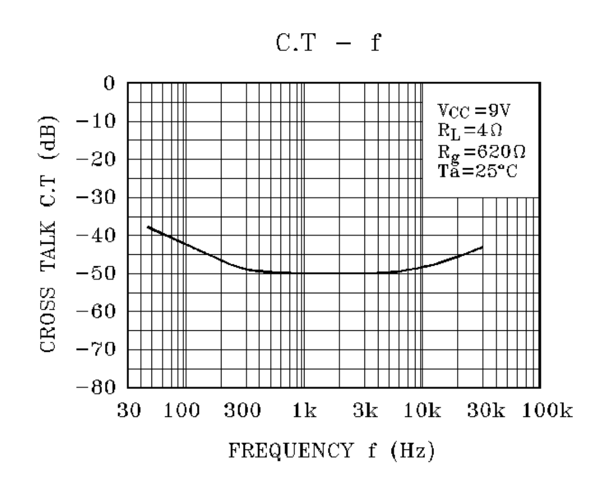

THD – P_{OUT}
V_{CC}=12V
R_L=4Ω
R_{NF}=120Ω
Ta=25°C
f=10kHz
f=100Hz
f=1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)


THD – P_{OUT}
R_L=4Ω
f=1kHz
R_{NF}=120Ω
Ta=25°C
V_{CC}=6V
V_{CC}=9V
V_{CC}=12V
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

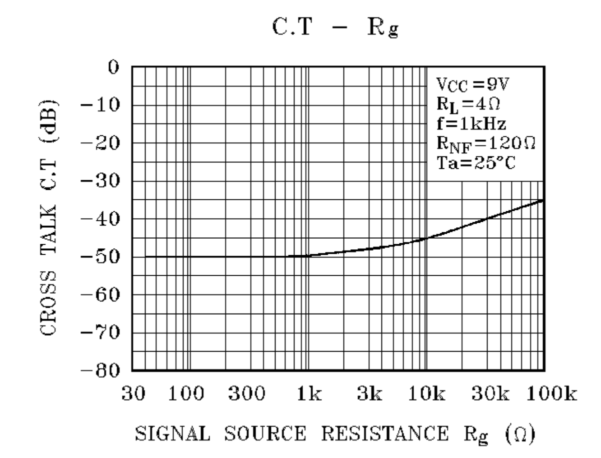

G_V – f
V_{CC}=9V
R_L=4Ω
R_{NF}=120Ω
Rg=620Ω
VOLTAGE GAIN G_V (dB)
FREQUENCY f (Hz)



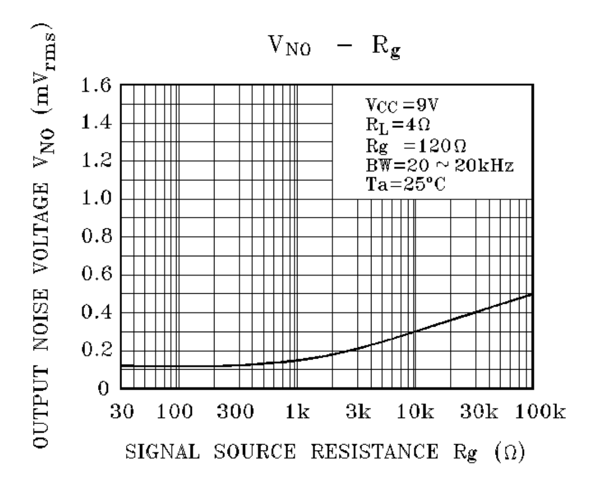
R.R − Rg
RIPPLE REJECTION RATIO R.R (dB)
0
−10
−20
−30
−40
−50
−60
−70
−80
VCC=9V
RL=4Ω
f=100Hz
RNF=120Ω
Ta=25°C
30 100 300 1k 3k 10k 30k 100k
SIGNAL SOURCE RESISTANCE Rg (Ω)



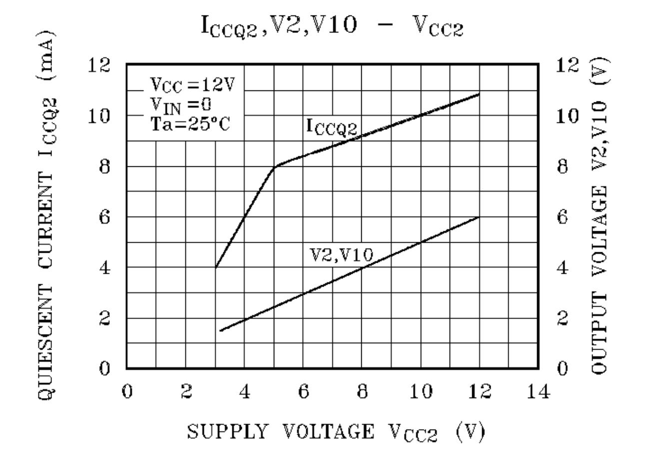
C.T − f
CROSS TALK C.T (dB)
0
−10
−20
−30
−40
−50
−60
−70
−80
VCC=9V
RL=4Ω
Rg=620Ω
Ta=25°C
30 100 300 1k 3k 10k 30k 100k
FREQUENCY f (Hz)



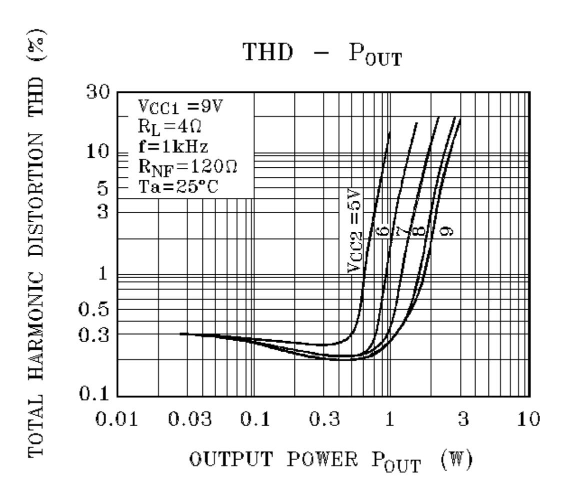
C.T − Rg
CROSS TALK C.T (dB)
0
−10
−20
−30
−40
−50
−60
−70
−80
VCC=9V
RL=4Ω
f=1kHz
RNF=120Ω
Ta=25°C
30 100 300 1k 3k 10k 30k 100k
SIGNAL SOURCE RESISTANCE Rg (Ω)



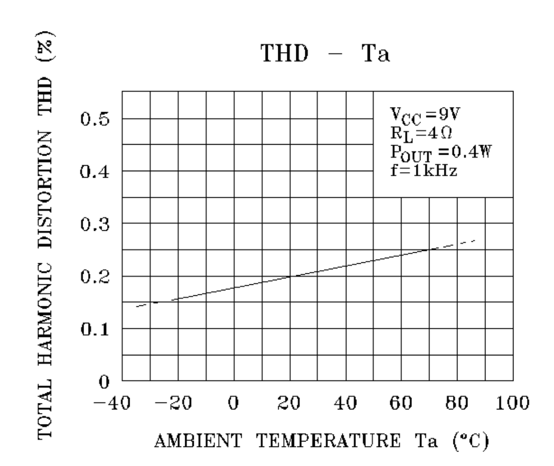
VNO − Rg
OUTPUT NOISE VOLTAGE VNO (mVrms)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
VCC=9V
RL=4Ω
Rg =120Ω
BW=20 ~ 20kHz
Ta=25°C
30 100 300 1k 3k 10k 30k 100k
SIGNAL SOURCE RESISTANCE Rg (Ω)

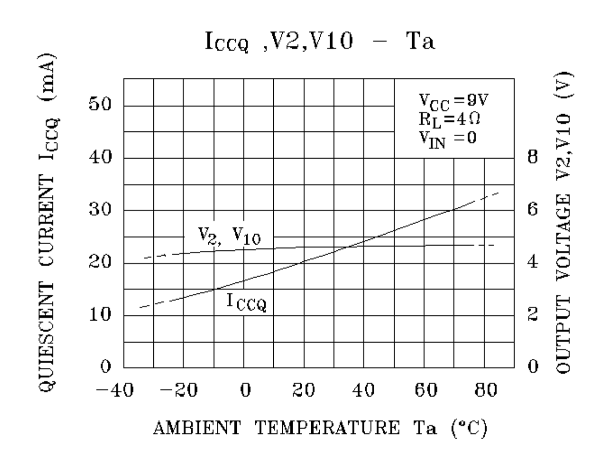


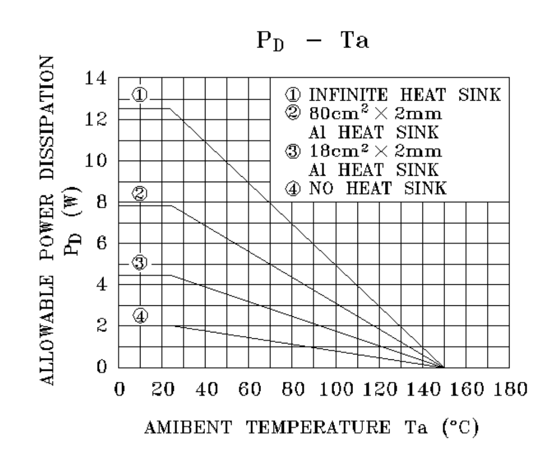
ICCQ2,V2,V10 − VCC2
QUIESCENT CURRENT ICCQ2 (mA)
OUTPUT VOLTAGE V2,V10 (V)
12
10
8
6
4
2
0
VCC=12V
VIN=0
Ta=25°C
ICCQ2
V2,V10
0 2 4 6 8 10 12 14
SUPPLY VOLTAGE VCC2 (V)

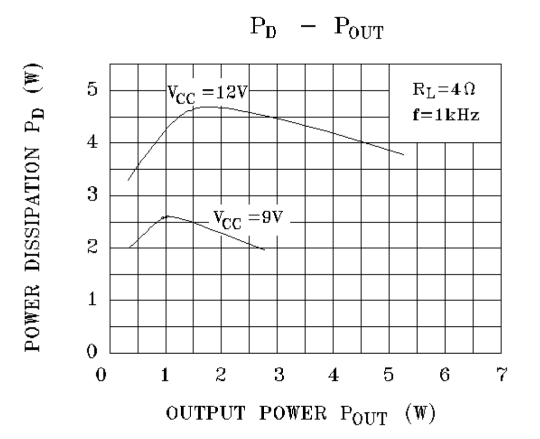


THD − POUT
TOTAL HARMONIC DISTORTION THD (%)
30
10
5
3
1
0.5
0.3
0.1
VCC1=9V
RL=4Ω
f=1kHz
RNF=120Ω
Ta=25°C
VCC2=5V
6
7
8
9
0.01 0.03 0.1 0.3 1 3 10
OUTPUT POWER POUT (W)


THD – Ta
TOTAL HARMONIC DISTORTION THD (%)
VCC=9V
RL=4Ω
POUT=0.4W
f=1kHz
0.5
0.4
0.3
0.2
0.1
0
−40 −20 0 20 40 60 80 100
AMBIENT TEMPERATURE Ta (°C)


ICCQ ,V2,V10 – Ta
QUIESCENT CURRENT ICCQ (mA)
OUTPUT VOLTAGE V2,V10 (V)
VCC=9V
RL=4Ω
VIN=0
V2, V10
ICCQ
50
40
30
20
10
0
8
6
4
2
0
−40 −20 0 20 40 60 80
AMBIENT TEMPERATURE Ta (°C)


PD – Ta
ALLOWABLE POWER DISSIPATION PD (W)
① INFINITE HEAT SINK
② 80cm² × 2mm Al HEAT SINK
③ 18cm² × 2mm Al HEAT SINK
④ NO HEAT SINK
14
12
10
8
6
4
2
0
0 20 40 60 80 100 120 140 160 180
AMIBENT TEMPERATURE Ta (°C)


PD – POUT
POWER DISSIPATION PD (W)
VCC=12V
VCC=9V
RL=4Ω
f=1kHz
5
4
3
2
1
0
0 1 2 3 4 5 6 7
OUTPUT POWER POUT (W)